

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-089230

(43)Date of publication of application : 09.04.1993

(51)Int.Cl.

G06F 15/64  
G02F 1/13  
G02F 1/135  
G09F 9/30  
H01L 27/14  
H01L 31/04  
H04N 1/028  
H04N 5/335

(21)Application number : 03-251873

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(22)Date of filing : 30.09.1991

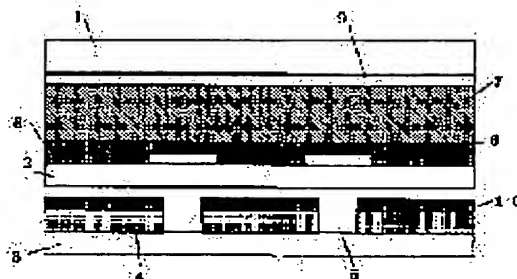
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YAMAGUCHI YOSHINORI

## (54) IMAGE READ/DISPLAY DEVICE

### (57)Abstract:

PURPOSE: To perform the display and the reading of a two-dimensional image by one device.

CONSTITUTION: An image reading means is formed by forming a light receiving element 6 and black passivation film 8 on a transparent substrate 2, and a stripe shape transparent electrode 9 is formed on the transparent substrate 1, and an image display means is formed by sealing liquid crystal 7 between the transparent substrates 1 and 2, and a plane light emitting element 4 and light shielding film 10 are formed on a transparent substrate 3, and furthermore, a plane light emitting means is formed by forming a light transmission window 5 at a position confronting with the light receiving element 6. Image display is performed by displaying the image with a simplex matrix system to control a voltage being impressed between the transference electrode 9 and a columnar direction electrode. The reading of the image is performed by making an original bring into contact closely with the transparent substrate 3 and having the plane light emitting element 4 emit light.



Full English Machine Translation  
of  
Japanese Unexamined Patent Application Publication No. 05-089230

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**CLAIMS**

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[Claim(s)]

[Claim 1]Image reading/display characterized by comprising the following.

A photo detector arranged in two dimensions on the 1st transparent substrate.

An image read means to which it comes to form the 1st and 2nd stripe like electrodes that intersect perpendicularly mutually for driving said photo detector one by one.

A liquid crystal is enclosed between said 1st transparent substrate and the 2nd transparent substrate, counter said 1st and 2nd stripe like electrodes on said 2nd transparent substrate, and. An image display means provided with the 3rd stripe like electrode allocated so that it might intersect perpendicularly with either of said 1st or 2nd stripe like electrode.

An image display driving means which impresses driver voltage for image display to said 3rd stripe like electrode and said 1st or 2nd stripe like electrode that intersects perpendicularly with this selectively, A surface light means to come to form in an opposite hand a surface light element which has a light transmission window with a side in which said image display means of said 1st transparent substrate is allocated.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the picture input/output device of information related equipments, such as a computer, and relates to the image reading/display which can perform presenting of information, and reading of a two-dimensional picture especially.

[0002]

[Description of the Prior Art] In recent years, what equips an information related equipment with a picture input device in addition to the image display device for displaying information is increasing. As an image display device, although various methods, such as CRT, a liquid crystal display (LCD), an EL display (ELD), and a plasma display device (PDP), are adopted, Also in it, LCD is low power consumption and it is broadly used from the small devices, such as a clock and an electronic calculator, to the large-sized thing of 10 inch sizes, such as a personal computer of a laptop type, for moreover excelling in the correspondence to colorization etc.

[0003] The image sensor using photoelectric conversion films, such as CCD or an amorphous silicon (a-Si), as an image sensor used for the image reader which is one of the picture input devices on the other hand is adopted widely. Since CCD is formed on a silicon wafer, in the TV camera etc., it is mainly widely used as a small image sensor, Since the image sensor using photoelectric conversion films, such as another side a-Si, can be formed in a large area substrate by vacuum deposition, a sputtering technique, etc., it is mainly used as image sensors for manuscript reading, such as a facsimile.

[0004] By the way, although conventionally installed as a device with separate image display device and image reader, The trial miniaturized combining an image display device and an image reader is also made, for example, in JP,1-106467,A The display device for image display, Making the photo detector for image reading approach on the same board being proposed, and providing LCD on an individual image sensor in JP,59-19369,A is proposed.

[0005]

[Problem(s) to be Solved by the Invention] However, since it is necessary to use a big substrate and to add the light source for image reading separately in order to put in practical use what is shown in JP,1-106467,A, it cannot but become a large-sized device. Although what is shown in JP,59-19369,A is suitable for small devices, such as a TV

camera, it is inapplicable to the device for reading the picture of the manuscript of a large area.

[0006] This invention solves the above-mentioned technical problem. The purpose is to provide the image reading/display in which reading of the two-dimensional picture of a large area is also possible, and it not only can display information, but it can moreover attain a miniaturization.

[0007]

[The means for solving a technical problem, an operation, and an effect of the invention] Then, the photo detector in which the image reading/display of this invention have been arranged in two dimensions on the 1st transparent substrate, The image read means to which it comes to form the 1st and 2nd stripe like electrodes that intersect perpendicularly mutually for driving said photo detector one by one, A liquid crystal is enclosed between said 1st transparent substrate and the 2nd transparent substrate, counter said 1st and 2nd stripe like electrodes on said 2nd transparent substrate, and. An image display means provided with the 3rd stripe like electrode allocated so that it might intersect perpendicularly with either of said 1st or 2nd stripe like electrode, The image display driving means which impresses the driver voltage for image display to said 3rd stripe like electrode and said 1st or 2nd stripe like electrode that intersects perpendicularly with this selectively, The side in which said image display means of said 1st transparent substrate is allocated attains the above-mentioned purpose by having a surface light means to come to form in an opposite hand the surface light element which has a light transmission window.

[0008] In the image reading/display of this invention, When displaying a picture, only an image display means drives and a display of a picture is performed like the conventional LCD, In performing image reading, a surface light means and an image read means drive, light emitted from a surface light means is reflected with a manuscript, it enters into a photo detector, and reading of a picture is performed.

[0009] Therefore, according to this invention, a device which can perform a display of a picture and reading of a picture is realizable. Since an image read means is provided with a two-dimensional image sensor and uses a surface light object as a light source, it does not need to establish a driving means for moving a light source etc. like the conventional image reader, and can miniaturize it. Since an electrode for sharing a substrate of an image read means, i.e., a substrate with which a photo detector is formed, as a substrate which encloses a liquid crystal for image display, and driving a photo detector is shared for a drive of a liquid crystal display element, it can constitute cheaply.

[0010]

[Example] Hereafter, an example is described, referring to drawings. The perspective view and drawing 2 in which the composition of the outline of one example of the image reading/display which requires drawing 1 for this invention is shown are the detailed sectional view.

[0011] On the transparent substrate 2 which consists of glass etc., the photo detector 6 is formed in two dimensions, and also the black passivation film 8 which consists the photo detector 6 of wrap polyimide is formed on it, and the image read means is formed. Although the photo detector 6 shall use the photo-diode formed by a-Si in this example, It can be used if it has a photoelectric conversion function as the photo detector 6, and in addition to the photo-diode formed by a-Si, the a-Si optoelectric transducer of CdS, CdSe, or a TFT drive, etc. can also be used. the difference kana from the place which these electrodes mention later although the electrode of a line writing direction and the electrode of a column direction which intersect perpendicularly mutually [ although not illustrated to drawing 1 and drawing 2 / in order to drive the photo detector 6 ] are required -- it is formed on the photo detector 6 like. It can replace with the black passivation film 8, and can also be considered as the combination of a transparent passivation film and a light-shielding film.

[0012] The transparent electrode 9 of stripe shape is formed in the transparent substrate 1 which consists of glass etc., the liquid crystal 7 is enclosed between the transparent substrate 1 and the transparent substrate 2, and the image display means is formed. The stripe like electrode 9 is allocated so that it may intersect perpendicularly with the line writing direction electrode for driving the photo detector 6, a column direction electrode, and the position that counters with either one of a line writing direction electrode or a column direction electrode. Therefore, the field between the line writing direction electrode or column direction electrode which intersects perpendicularly with the transparent electrode 9 concerned and the transparent electrode 9 of the electrodes for driving the photo detector 6 serves as a liquid crystal display element. Although the liquid crystal material which does not need the deflection plate which distributed the spherical small liquid crystal capsule in organic polymer shall be used as the liquid crystal 7 in this example, as for the transparent electrode 9 side of the transparent substrate 1, if a deflection plate is allocated in the field of an opposite hand, it will be in difference that it is also possible to use the liquid crystal material using a deflection plate. It is also possible to use liquid crystal materials, such as guest host mode.

[0013] The surface light element 4 and the light-shielding film 10 are formed in the

transparent substrate 3 which consists of glass etc. at this order, the light transmission window 5 is formed in the position which counters that photo detector 6 further, and the surface light means is formed. Although the surface light element 4 is used as the EL light emitting element using electroluminescence in this example, if it is a surface light element which can be used as a light source for image reading, such as LED (Light Emitting Diode), generally it can be used. The light-shielding film 10 is to keep the light which emitted light from the surface light element 4 from entering into the photo detector 6 directly.

[0014]The light-shielding film 10 can also make the electrode of an EL light emitting element serve a double purpose as the light-shielding film 10, although it can form of course by carrying out film deposition of the opaque materials, such as aluminum and Cr, to an EL light emitting element by vacuum deposition, a sputtering technique, etc. That is, the surface light element 4 provided with the light-shielding film 10 can be formed by laminating the back plate 34 which becomes the transparent substrate 3 from the transparent electrode 30, the insulating layer 31, the luminous layer 32, the insulating layer 33, and aluminum as shown in drawing 3 in this order.

[0015]Next, the structure of the photo detector 6 and its drive circuit are explained in detail. Drawing 4 is a figure showing the equivalent circuit of the photo detector 6 arranged by two dimensions, and the one photo detector 6 has the composition that two photo-diodes of each other were connected in series for reverse. The shift register 11 is connected to the electrode of a column direction, and the analog switch 12 is connected to the electrode of a line writing direction, and also current / voltage converter 13 is connected to the analog switch 12. And operation of one line of reading is performed at a time, and the signal per element is taken out from current / voltage converter 13 with the shift register 11.

[0016]Drawing 5 is a figure showing the example of a layout with the photo detector 6 and the stripe like electrode of a line writing direction and a column direction.

Six show a photo detector among a figure, 14 shows a line writing direction electrode, and 15 shows a column direction electrode.

And if it shall be allocated so that the column direction electrode 15 and the transparent electrode 9 for driving a liquid crystal display element now may cross at right angles, the portion shown by A will be shared as an electrode for driving a liquid crystal display element among a figure.

[0017]Drawing 6 is a figure showing the B-B' section of drawing 5, the transparent electrode 16 is formed in the transparent substrate 2, and the photoelectric conversion

film 17, the a-Si photoelectric conversion film 18, and the electrode 20 which were doped to the n type are formed on it. Therefore, two photo-diodes which form the photo detector 6 are formed between the transparent electrode 16 and the electrode 20, respectively. And the contact electrode 21 connected with the line writing direction electrode 14 via the insulating layer 19 is connected to the electrode 20 of one photo-diode, and the column direction electrode 15 is connected to the electrode 20 of the photo-diode of another side.

[0018]Next, operation of the image reading/display shown in drawing 1 is explained. First, when using the image reading/the display concerned as an image display device, a picture can be displayed with the passive matrix which controls the voltage impressed between the transparent electrode 9 and the column direction electrode 15. Namely, in the state where voltage is not impressed to the transparent electrode 9 and the column direction electrode 15, since it is random in the orientation of a liquid crystal, the lights which entered from the transparent substrate 1 side are scattered about, and look white, but. Since the orientation of a liquid crystal gathers when predetermined voltage is impressed to the column direction electrode 15 and the transparent electrode 9, as shown in drawing 7, The picture displayed from the transparent substrate 1 side is observable by penetrating the light which entered, and the black of the black passivation film 8 which is a ground being able to be seen, therefore impressing predetermined voltage to a liquid crystal display element selectively.

[0019]When using the image reading/the display concerned as an image reader, the manuscript 22 is stuck to the transparent substrate 3, and the surface light element 4 is made to emit light, as shown in drawing 8. Emanating from the surface light element 4, the light reflected with the manuscript 22 enters into the photo detector 6 through the light transmission window 5. And since the light volume which enters into the photo detector 6 changes according to the picture information of the manuscript 22, i.e., the concentration of a picture, from the photo detector 6, the electrical signal according to the concentration of each pixel is acquired, and image reading is performed by this.

[0020]As it is also possible to input arbitrary handwriting images by entering the light of the optical light pen 25 in the photo detector 6 directly as shown in drawing 9 and also it is shown in drawing 10, It is also possible to arrange the image formation lens 26 to the transparent substrate 3 side, to carry out image formation of the image of the photographic subject which is not illustrated to the photo detector 6 with the image formation lens 26, and to picturize a desired image.

[0021]As mentioned above, although one example of this invention was described, this

invention is not limited to the above-mentioned example, and various modification is possible for it. For example, in the above-mentioned example, although the surface light element 4 shall be formed all over the transparent substrate 3, as 4a and 4b of drawing 11 show, it can make a surface light element stripe shape. However, the direction of this stripe needs to be formed corresponding to the same light receiving element line as the line writing direction of the photo detector 6, i.e., the arrangement direction of the shift register 11 of drawing 4. Namely, since reading operation of one line of the signal from a photo detector is performed at a time as mentioned above, it is in difference that it is not necessary to cross the surface light element 4 to the whole surface, and to make light emit simultaneously, and what is necessary is just to make only the field corresponding to the line in which reading operation of a signal is performed at least emit light, therefore the surface light element can be made into the stripe shape for every line to which reading operation of a photo detector is performed. And according to this, power consumption can be reduced. One light emitting device may be formed corresponding to one photo detector.

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## TECHNICAL FIELD

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[Industrial Application]This invention relates to the picture input/output device of information related equipments, such as a computer, and relates to the image reading/display which can perform presenting of information, and reading of a two-dimensional picture especially.

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## PRIOR ART

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[Description of the Prior Art]In recent years, what equips an information related equipment with a picture input device in addition to the image display device for displaying information is increasing. As an image display device, although various methods, such as CRT, a liquid crystal display (LCD), an EL display (ELD), and a plasma display device (PDP), are adopted, Also in it, LCD is low power consumption and it is broadly used from the small devices, such as a clock and an electronic calculator, to the large-sized thing of 10 inch sizes, such as a personal computer of a laptop type, for moreover excelling in the correspondence to colorization etc.



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## EFFECT OF THE INVENTION

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## TECHNICAL PROBLEM

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## EXAMPLE

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detector 6 directly.

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[0020]As it is also possible to input arbitrary handwriting images by entering the light of the optical light pen 25 in the photo detector 6 directly as shown in drawing 9 and also it is shown in drawing 10, It is also possible to arrange the image formation lens 26 to the transparent substrate 3 side, to carry out image formation of the image of the photographic subject which is not illustrated to the photo detector 6 with the image formation lens 26, and to picturize a desired image.

[0021]As mentioned above, although one example of this invention was described, this invention is not limited to the above-mentioned example, and various modification is possible for it. For example, in the above-mentioned example, although the surface light element 4 shall be formed all over the transparent substrate 3, as 4a and 4b of drawing 11 show, it can make a surface light element stripe shape. However, the direction of this stripe needs to be formed corresponding to the same light receiving element line as the line writing direction of the photo detector 6, i.e., the arrangement direction of the shift register 11 of drawing 4. Namely, since reading operation of one line of the signal from

a photo detector is performed at a time as mentioned above, it is in difference that it is not necessary to cross the surface light element 4 to the whole surface, and to make light emit simultaneously, and what is necessary is just to make only the field corresponding to the line in which reading operation of a signal is performed at least emit light, therefore the surface light element can be made into the stripe shape for every line to which reading operation of a photo detector is performed. And according to this, power consumption can be reduced. One light emitting device may be formed corresponding to one photo detector.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a perspective view showing the outline composition of one example of this invention.

[Drawing 2] It is a more detailed sectional view of composition of being shown in drawing 1.

[Drawing 3] It is a figure showing the constructional example of a surface light element.

[Drawing 4] It is a figure showing the equivalent circuit of the photo detector arranged by two dimensions.

[Drawing 5] It is a figure showing the example of a layout with a photo detector and the stripe like electrode of a line and a column direction.

[Drawing 6] It is a B-B' sectional view of drawing 5.

[Drawing 7] It is a figure for explaining the operation in the case of using it as an image display device.

[Drawing 8] It is a figure for explaining the operation in the case of using it as an image reader.

[Drawing 9] It is a figure for explaining the image input method by an optical light pen.

[Drawing 10] It is a figure for explaining the image input method using an image formation lens.

[Drawing 11] It is a figure showing a modification.

[Description of Notations]

1, 2, 3 [ -- A photo detector, 7 / -- A liquid crystal, 8 / -- A passivation film 9 / -- A transparent electrode, 10 / -- Light-shielding film. ] -- A transparent substrate, 4 -- A surface light element, 5 -- A light transmission window, 6

(19)日本国特許庁(JP)

(12) 公開特許公報(A)

(11)特許出願公開番号

特開平5-89230

(43)公開日 平成5年(1993)4月9日

(51)Int.Cl. <sup>5</sup>	識別記号	庁内整理番号	FI	技術表示箇所
G 0 6 F 15/64	3 2 0 G	8840-5L		
G 0 2 F 1/13	5 0 5	8806-2K		
1/135		7348-2K		
		7210-4M	H 0 1 L 27/ 14	K
		7376-4M	31/ 04	J
審査請求 未請求 請求項の数 1(全 6 頁) 最終頁に続く				

(21)出願番号 特願平3-251873

(22)出願日 平成3年(1991)9月30日

(71)出願人 000005496

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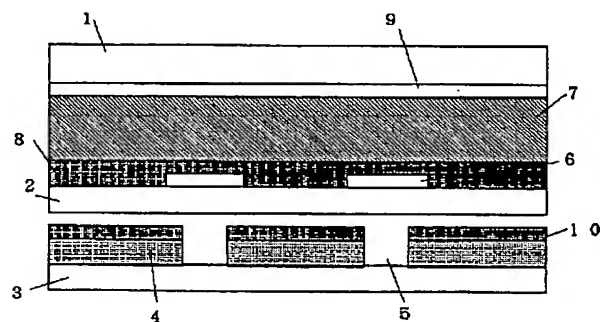
(74)代理人 弁理士 菅井 英雄 (外7名)

(54)【発明の名称】 画像読み取り／表示装置

(57)【要約】

【目的】 一つの装置で二次元画像の表示及び二次元画像の読み取りを行う。

【構成】 透明基板2上には受光素子6と黒色のパッシベーション膜8が形成されて画像読み取り手段が形成され、透明基板1にはストライプ状の透明電極9が形成され、透明基板1と透明基板2との間には液晶7が封入されて画像表示手段が形成され、透明基板3には面発光素子4、遮光膜10が形成され、更にその受光素子6に対向する位置には光透過窓5が形成されて面発光手段が形成されている。画像表示は、透明電極9と列方向電極15の間に印加する電圧を制御する単純マトリクス方式により画像の表示を行う。画像読み取りを行う場合には、透明基板3に原稿22を密着させ、面発光素子4を発光させる。



## 【特許請求の範囲】

【請求項1】 第1の透明基板上に、二次元的に配置された受光素子と、前記受光素子を駆動するための互いに直交する第1及び第2のストライプ状電極が順次形成されてなる画像読み取り手段と、

前記第1の透明基板と第2の透明基板との間に液晶が封入され、且つ前記第2の透明基板上に、前記第1及び第2のストライプ状電極に対向すると共に、前記第1または第2のストライプ状電極のいずれか一方と直交するように配設された第3のストライプ状電極とを備える画像表示手段と、

前記第3のストライプ状電極とこれに直交する前記第1または第2のストライプ状電極に選択的に画像表示のための駆動電圧を印加する画像表示駆動手段と、

前記第1の透明基板の前記画像表示手段が配設される側とは反対側に、光透過窓を有する面発光素子が形成されてなる面発光手段とを備えることを特徴とする画像読み取り／表示装置。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、コンピュータ等の情報関連機器の画像入出力装置に係り、特に、情報の表示及び二次元画像の読み取りを行うことができる画像読み取り／表示装置に関する。

## 【0002】

【従来の技術】近年、情報関連機器には、情報を表示するための画像表示装置に加えて画像入力装置を備えるものが増えてきている。画像表示装置としては、CRT、液晶表示装置(LCD)、EL表示装置(ELD)、プラズマ表示装置(PDP)等種々の方式が採用されているが、その中でもLCDは低消費電力で、しかもカラー化への対応に優れていること等のために時計や電子式卓上計算機等の小型の装置からラップトップ型のパーソナルコンピュータ等の10インチサイズの大型のものまで幅広く利用されている。

【0003】一方、画像入力装置の一つである画像読み取り装置に用いられるイメージセンサとしては、CCDあるいはアモルファスシリコン(a-Si)等の光電変換膜を用いたイメージセンサが広く採用されている。CCDはシリコンウエハー上に形成されるので、主としてTVカメラ等において小型のイメージセンサとして広く用いられており、他方a-Si等の光電変換膜を用いたイメージセンサは蒸着法やスパッタ法等により大面積な基板に形成することができるので、主にファクシミリ等の原稿読み取り用イメージセンサとして用いられている。

【0004】ところで、従来は画像表示装置と画像読み取り装置とは別個の装置として設置されていたが、画像表示装置と画像読み取り装置とを組み合わせる小型化する試みもなされており、例えば特開平1-106467号公報に

おいては画像表示のための表示素子と、画像読み取りのための受光素子とを同一基板上に近接させることが提案され、また特開昭59-19369号公報においては個体撮像素子上にLCDを設けることが提案されている。

## 【0005】

【発明が解決しようとする課題】しかしながら、特開平1-106467号公報に示されるものを実用化するためには大きな基板を使用する必要があり、また画像読み取りのための光源を別途付加することが必要になるので、大型な装置とならざるを得ないものである。また特開昭59-19369号公報に示されるものは、TVカメラ等の小型の装置には適しているが、大面積の原稿の画像を読み取るための装置には適用できないものである。

【0006】本発明は、上記の課題を解決するものであって、情報の表示が行えるばかりでなく、大面積の二次元画像の読み取りも可能で、しかも小型化を達成できる画像読み取り／表示装置を提供することを目的とするものである。

## 【0007】

【課題を解決するための手段、作用及び発明の効果】そこで本発明の画像読み取り／表示装置は、第1の透明基板上に、二次元的に配置された受光素子と、前記受光素子を駆動するための互いに直交する第1及び第2のストライプ状電極が順次形成されてなる画像読み取り手段と、前記第1の透明基板と第2の透明基板との間に液晶が封入され、且つ前記第2の透明基板上に、前記第1及び第2のストライプ状電極に対向すると共に、前記第1または第2のストライプ状電極のいずれか一方と直交するように配設された第3のストライプ状電極とを備える画像表示手段と、前記第3のストライプ状電極とこれに直交する前記第1または第2のストライプ状電極に選択的に画像表示のための駆動電圧を印加する画像表示駆動手段と、前記第1の透明基板の前記画像表示手段が配設される側とは反対側に、光透過窓を有する面発光素子が形成されてなる面発光手段とを備えることによって上記目的を達成するものである。

【0008】本発明の画像読み取り／表示装置においては、画像の表示を行う場合には画像表示手段のみが駆動されて従来のLCDと同様に画像の表示が行われ、画像読み取りを行う場合には面発光手段と画像読み取り手段とが駆動され、面発光手段から放射された光は原稿で反射され、受光素子に入射されて画像の読み取りが行われる。

【0009】従って本発明によれば、画像の表示と画像の読み取りを行える装置を実現することができる。また、画像読み取り手段は二次元イメージセンサを備え、且つ光源として面発光体を用いるので、従来の画像読み取り装置のように光源等を移動させるための駆動手段を設ける必要はなく、小型化が可能である。更に、画像読み取り手段の基板、即ち受光素子が形成される基板を画



像表示のための液晶を封入する基板として共用し、且つ受光素子を駆動するための電極を液晶表示素子の駆動のために共用するので安価に構成することができるものである。

#### 【0010】

【実施例】以下、図面を参照しつつ実施例を説明する。図1は本発明に係る画像読み取り／表示装置の一実施例の概略の構成を示す斜視図、図2はその詳細な断面図である。

【0011】ガラス等からなる透明基板2上には受光素子6が二次元的に形成され、更にその上には受光素子6を覆うポリイミドからなる黒色のパッシベーション膜8が形成されて画像読み取り手段が形成されている。この実施例では受光素子6はa-Siで形成したフォトダイオードを用いるものとするが、受光素子6としては光電変換機能を有するものであれば使用することができるものであり、a-Siで形成したフォトダイオード以外には、CdS、CdSeあるいはTFT駆動のa-Si光電変換素子などを用いることもできるものである。なお、図1、図2には図示しないが、受光素子6を駆動するために互いに直交する行方向の電極及び列方向の電極が必要であるが、これらの電極は後述するところから明らかなように受光素子6の上に形成されるものである。また、黒色のパッシベーション膜8に代えて、透明なパッシベーション膜と遮光膜の組み合わせとすることもできる。

【0012】ガラス等からなる透明基板1にはストライプ状の透明電極9が形成され、透明基板1と透明基板2との間には液晶7が封入されて画像表示手段が形成されている。ストライプ状電極9は、受光素子6を駆動するための行方向電極、列方向電極と対向する位置に、行方向電極または列方向電極のいずれか一方と直交するように配設されている。従って、当該透明電極9と、受光素子6を駆動するための電極のうちの透明電極9と直交する行方向電極または列方向電極との間の領域が液晶表示素子となる。なお、この実施例では液晶7としては、有機ポリマー中に球状の小液晶カプセルを分散させた偏向板を必要としない液晶材料を用いるものとするが、透明基板1の透明電極9側とは反対側の面に偏向板を配設すれば偏向板を用いる液晶材料を使用することも可能であることは明らかなである。またゲストホストモードなどの液晶材料を用いることも可能である。

【0013】ガラス等からなる透明基板3には面発光素子4、遮光膜10がこの順序に形成され、更にその受光素子6に対向する位置には光透過窓5が形成されて面発光手段が形成されている。この実施例では面発光素子4は電界発光を利用したEL発光素子とするが、LED(Light Emitting Diode)等の画像読み取りのための光源として使用できる面発光素子であれば一般的に使用することができるものである。また、遮光膜10は面発光

素子4から発光された光が直接受光素子6に入射しないようにするためのものである。

【0014】遮光膜10は、EL発光素子にAl、Cr等の不透明な材料を蒸着法、スパッタ法等により着膜することによって形成できることは勿論であるが、EL発光素子の電極を遮光膜10として兼用することもできる。即ち、図3に示すように透明基板3に、透明電極30、絶縁層31、発光層32、絶縁層33、Alからなる背面電極34をこの順序に積層することによって遮光膜10を備える面発光素子4を形成することができる。

【0015】次に、受光素子6の構造及びその駆動回路について詳細に説明する。図4は二次元に配列された受光素子6の等価回路を示す図であり、一つの受光素子6は二つのフォトダイオードが互いに逆向きに直列に接続された構成となっている。列方向の電極にはシフトレジスタ11が接続され、行方向の電極にはアナログスイッチ12が接続され、更にアナログスイッチ12には電流／電圧変換器13が接続されている。そして、読み取りの動作は1行ずつ行われ、シフトレジスタ11によって1素子ずつの信号が電流／電圧変換器13から取り出される。

【0016】図5は、受光素子6と、行方向及び列方向のストライプ状電極とのレイアウトの例を示す図であり、図中、6は受光素子、14は行方向電極、15は列方向電極を示す。そしていま、液晶表示素子を駆動するための透明電極9が列方向電極15と直交するように配設されているものとする、図中、Aで示す部分は液晶表示素子を駆動するための電極として共用される。

【0017】図6は図5のB-B'断面を示す図であり、透明基板2には透明電極16が形成され、その上にn型にドーピングした光電変換膜17、a-Si光電変換膜18、電極20が形成されている。従って、受光素子6を形成する二つのフォトダイオードは、それぞれ透明電極16と電極20との間に形成される。そして絶縁層19を介して行方向電極14と接続されるコンタクト電極21が一方のフォトダイオードの電極20に接続され、列方向電極15が他方のフォトダイオードの電極20に接続されている。

【0018】次に、図1に示す画像読み取り／表示装置の動作について説明する。まず、当該画像読み取り／表示装置を画像表示装置として使用する場合には、透明電極9と列方向電極15の間に印加する電圧を制御する単純マトリクス方式により画像の表示を行うことができる。即ち、透明電極9と列方向電極15に電圧を印加しない状態では液晶の配向がランダムとなっているので、透明基板1側から入射した光は散乱し白色に見えるが、図7に示すように列方向電極15と透明電極9に所定の電圧を印加した場合には液晶の配向が揃うので、入射した光を透過して下地である黒色のパッシベーション膜8の黒色が見えることになり、従って液晶表示素子に選択

的に所定の電圧を印加することによって透明基板1 側から表示される画像を観察することができる。

【0019】また、当該画像読み取り／表示装置を画像読み取り装置として使用する場合には、図8 に示すように、透明基板3 に原稿2 2 を密着させ、面発光素子4 を発光させる。面発光素子4 から放射され、原稿2 2 で反射された光は光透過窓5 を通って受光素子6 に入射する。そして受光素子6 に入射する光量は原稿2 2 の画像情報、即ち画像の濃度に応じて変わるので、受光素子6 からは各画素の濃度に応じた電気信号が得られ、これによって画像読み取りが行われる。

【0020】また、図9 に示すように、光学式ライトペン2 5 の光を直接受光素子6 に入射させることによって任意の手書き画像の入力を行うことも可能であり、更に図10 に示すように、透明基板3 側に結像レンズ2 6 を配置し、図示しない被写体の像を結像レンズ2 6 で受光素子6 に結像させて所望の像の撮像を行うことも可能である。

【0021】以上、本発明の一実施例について説明したが、本発明は上記実施例に限定されるものではなく種々の変形が可能である。例えば、上記実施例では面発光素子4 は透明基板3 の全面に形成されるものとしたが、図11 の4 a、4 b で示すように面発光素子はストライプ状とすることができる。ただしこのストライプの方向は受光素子6 の行方向、即ち図4 のシフトレジスタ1 1 の配列方向と同じ受光素子列に対応して形成される必要がある。即ち、上述したように受光素子からの信号の読み取り動作は1 行ずつ行われるので、面発光素子4 を全面に渡って同時に発光させる必要はなく、少なくとも信号の読み取り動作が行われる行に対応する領域だけを発光\*30

\*させればよいことは明きらかであり、従って面発光素子を受光素子の読み取り動作が行われる行毎のストライプ状とすることができるのである。そしてこれによれば消費電力を低減させることができる。また、一つの受光素子に対応して一つの発光素子を形成してもよいものである。

【図面の簡単な説明】

【図1】 本発明の一実施例の概略構成を示す斜視図である。

【図2】 図1 に示す構成のより詳細な断面図である。

【図3】 面発光素子の構造例を示す図である。

【図4】 二次元に配列された受光素子の等価回路を示す図である。

【図5】 受光素子と、行、列方向のストライプ状電極とのレイアウトの例を示す図である。

【図6】 図5 のB-B' 断面図である。

【図7】 画像表示装置として使用する場合の動作を説明するための図である。

【図8】 画像読み取り装置として使用する場合の動作を説明するための図である。

【図9】 光学式ライトペンによる画像入力方法を説明するための図である。

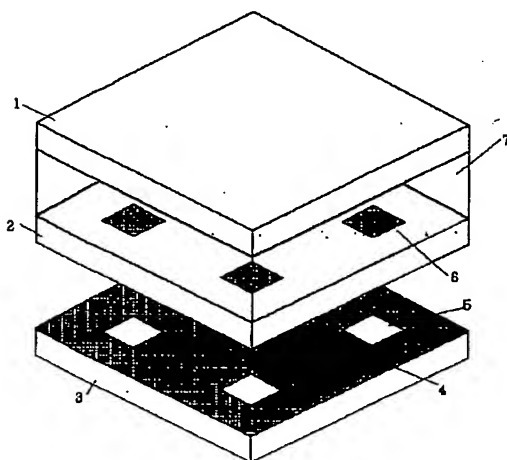
【図10】 結像レンズを用いた画像入力方法を説明するための図である。

【図11】 変形例を示す図である。

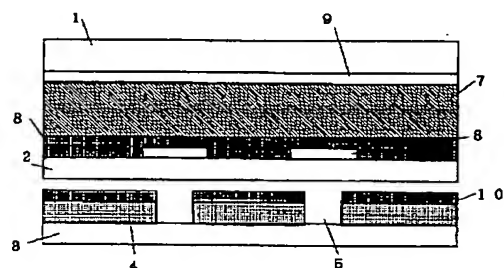
【符号の説明】

1、2、3…透明基板、4…面発光素子、5…光透過窓、6…受光素子、7…液晶、8…パッシベーション膜、9…透明電極、10…遮光膜。

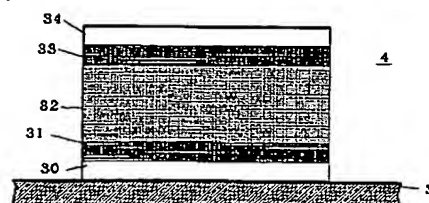
【図1】



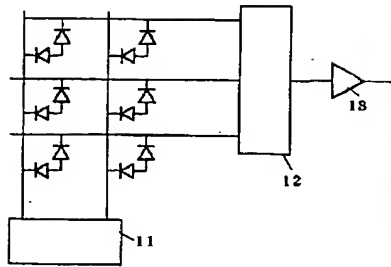
【図2】



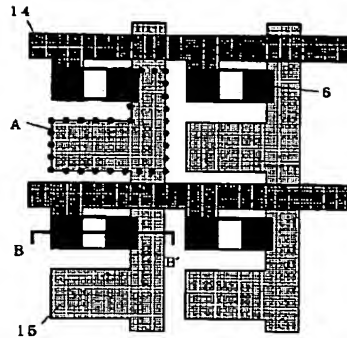
【図3】



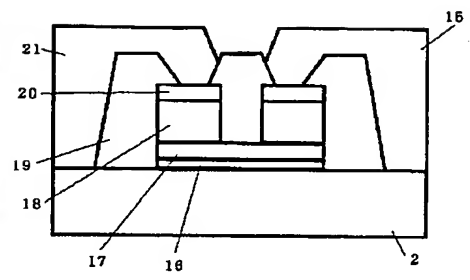
【図4】



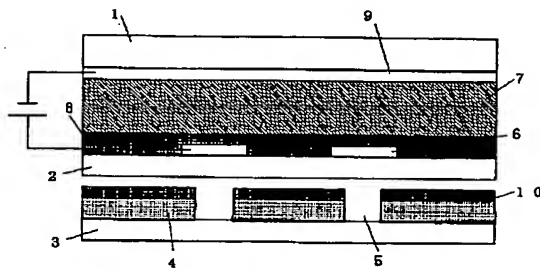
【図5】



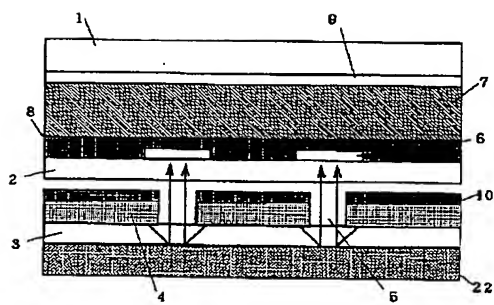
【図6】



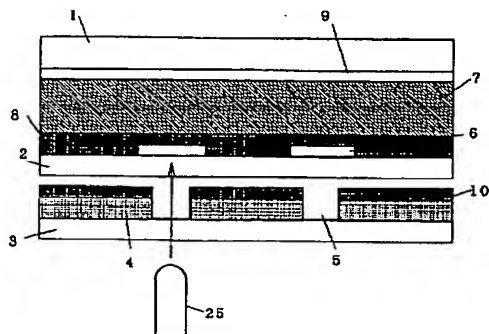
【図7】



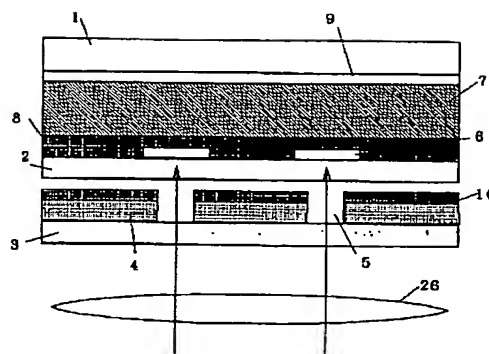
【図8】



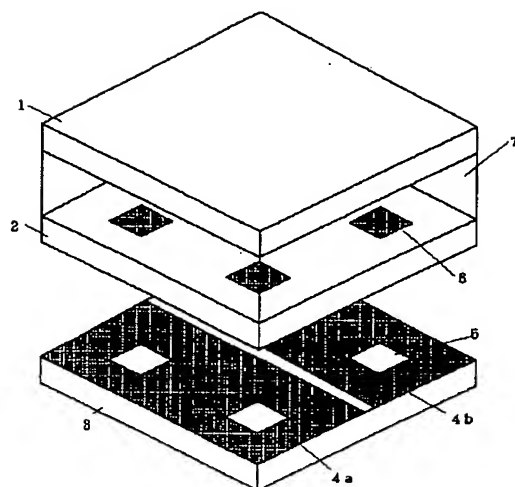
【図9】



【図10】



【図11】



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(51)Int. Cl.<sup>5</sup>

G 0 9 F 9/30

H 0 1 L 27/14

31/04

H 0 4 N 1/028

5/335

識別記号

庁内整理番号

F I

技術表示箇所

A 7926-5G

Z 9070-5C

Z 8838-5C